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New Scale Development for Enhanced Suitability Screening

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 The Tailored Adaptive Personality Assessment System (TAPAS) has demonstrated validity for predicting important military outcomes in a broad range of positions in the U.S. Army. Nevertheless, assessing additional personality dimensions may help to improve prediction and provide a more complete profile of individuals. Therefore, the goal of the present task was to identify additional traits that are not measured by the TAPAS but could be developed to improve the prediction of performance and counterproductive work behavior. After conducting a review of the literature, six new dimensions were identified that could be incorporated into the TAPAS. Next, large statement pools were developed for each dimension and pretested in a sample of over 2,000 Soldiers. This effort produced approximately 278 useable statements with at least 45 statements per dimension. Subsequent research is needed to examine the validity of these new scales.

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NEW SCALE DEVELOPMENT FOR ENHANCED SUITABILITY SCREENING

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Introduction

This report is intended to provide a brief overview of the scale development process for six new temperament scales that were developed for the Enhanced Suitability Screening (ESS) of positions of significant trust and authority. The goal of this work was to identify additional dimensions that could be added to the Tailored Adaptive Personality Assessment System (TAPAS), which is a major component of the ESS, to provide better prediction of performance and counterproductive work behavior (CWB). Because CWB is a significant dimension of overall job performance, this research will attempt to identify predictors of this outcome.

Background

The TAPAS was developed by Drasgow Consulting Group (DCG) under the Army's Small Business Innovation Research (SBIR) grant program (Drasgow, Stark, Chernyshenko, Nye, Hulin, & White, 2012). It takes advantage of modern psychometric methods and computing technology to offer a new generation of personality measures that (a) are fake-resistant, (b) utilize computer adaptive technology to measure a broad range of trait continua, and (c) are easily customized to meet the assessment needs of diverse occupations and military occupational specialties (MOS). TAPAS can measure up to 27 personality dimensions or facets. Of these, 21 cover the behavioral patterns associated with the well-known Big Five personality framework (Goldberg, 1993). The remaining six dimensions cover military-specific temperament traits (Physical Conditioning, Courage, Team-Orientation, Adventure Seeking, Situational Awareness, and Commitment to Serve). With this structure, the TAPAS is among the most comprehensive measures of personality facets that are currently available (Drasgow et al., 2012). Due to the measurement approach used and the broad range of facets assessed, the TAPAS is expected to demonstrate validity even in high-stakes settings where applicants may be motivated to respond dishonestly.

In fact, a growing body of evidence suggests that the TAPAS is useful for predicting a wide variety of performance criteria (Knapp & Wolters, 2017). A number of research studies have examined the validity of the TAPAS for predicting performance outcomes in a broad range of occupations and assignments within the U.S. Army. Results from these studies have shown that the TAPAS can provide significant incremental validity over the Armed Serviced Vocational Aptitude Battery (ASVAB: a military entrance exam) for predicting attrition, end of training criteria, and in-unit performance (Knapp & Heffner, 2009; Knapp, Owens, & Allen, 2011; Knapp & Wolters, 2017). In addition, this research has also shown that the TAPAS provided non-trivial gains in classification efficiency over the ASVAB alone. For example, when TAPAS trait scores were added into a regression analysis based on a sample of several hundred Soldiers that included the Armed Forces Qualification Test (AFQT), the multiple correlations increased by .26 for the prediction of physical fitness, by .16 for the prediction of disciplinary incidents, and by .20 for the prediction of 6-month attrition (Allen, Cheng, Putka, Hunter, & White, 2010). None of these criteria were predicted well by AFQT alone (predictive validity estimates were consistently below .10).

Additional research demonstrated the utility of the TAPAS for predicting performance within specific MOS (Nye, Drasgow, Chernyshenko, Stark, Kubisiak, White, & Jose, 2012). Specifically, Nye et al. (2012) developed composites for predicting important criteria in both an Army-wide sample and in specific MOS. They found adjusted (for capitalization on chance) multiple correlations of .27, .34, .18, and .35 for MOS 11B, 31B, 68W, and 88M, respectively, for predicting a can-do measure of performance. Similar composites were also developed for predicting will-do performance criteria with the corrected multiple correlations ranging from .24 to .36 for the same MOS. These results suggest that the TAPAS is useful for predicting performance across a broad range of military specialties. Other research has found similarly positive results for predicting attitudes and performance for Recruiters (Horgen, Nye, White, LaPort, Hoffman, Drasgow et al., 2013) and for Army Special Operations Forces (Nye, Beal, Drasgow, Dressel, White, & Stark, 2014).

Based on this previous research, the purpose of the current work was to examine the TAPAS as a noncognitive predictor of performance and counterproductive behavior in positions of significant trust and authority. As described above, the TAPAS has demonstrated validity for predicting performance in a broad range of Army occupations and special duty assignments. To predict performance across positions that vary in terms of their tasks and requirements, a broad measure that assesses a range of individual characteristics is needed. As such, the TAPAS is well-suited for this task. Table 1 describes the 27 dimensions that can be assessed in the TAPAS.

Table 1. *Personality Characteristics Assessed by the TAPAS*

TAPAS Facet Name	Brief Description	"Big Five" Broad Factor
Attention Seeking	High scoring individuals tend to engage in behaviors that attract social attention; they are loud, loquacious, entertaining, and even boastful.	Extraversion
Dominance	High scoring individuals are domineering, "take charge" and are often referred to by their peers as "natural leaders."	
Sociability	Describes an individual's level of interest in friendly social interactions.	
Consideration	High scoring individuals are affectionate, compassionate, sensitive, and caring.	Agreeableness
Cooperation	High scoring individuals are trusting, cordial, non-critical, and easy to get along with.	
Selflessness	High scoring individuals are generous with their time and resources.	
Achievement	High scoring individuals are seen as hard working, ambitious, confident, and resourceful.	Conscientiousness
Order	High scoring individuals tend to organize tasks and activities and desire to maintain neat and clean surroundings.	
Non-Delinquency	High scoring individuals tend to comply with rules, customs, norms, and expectations, and they tend not to challenge authority.	
Responsibility	High scoring individuals are dependable, reliable, and make every effort to keep their promises.	
Self-Control	High scoring individuals tend to be cautious, levelheaded, able to delay gratification, and patient.	
Virtue	High scoring individuals adhere to standards of honesty, morality, and "good Samaritan" behavior.	
Adjustment	High scoring individuals are worry free, and handle stress well; low scoring individuals are generally high strung, self-conscious and apprehensive.	Emotional Stability
Even Tempered	High scoring individuals tend to be calm and stable. They don't often exhibit anger, hostility, or aggression.	
Optimism	High scoring individuals have a positive outlook on life and tend to experience joy and a sense of well-being.	

TAPAS Facet Name	Brief Description	"Big Five" Broad Factor
Aesthetics	High scoring individuals appreciate various forms of art and music and participate in art-related activities more than most people.	Openness To Experience
Curiosity	High scoring individuals are inquisitive and perceptive; they are interested in learning new information and attend courses and workshops whenever they can.	
Depth	High scoring individuals tend to examine their lives and exhibit behaviors associated with self-improvement.	
Intellectual Efficiency	High scoring individuals are able to process information quickly and would be described by others as knowledgeable, astute, and intellectual.	
Ingenuity	High scoring individuals are inventive and can think "outside of the box."	
Tolerance	High scoring individuals are interested in other cultures and opinions that may differ from their own. They are willing to adapt to novel environments and situations.	
Adventure Seeking	High scoring individuals enjoy participating in extreme sports and outdoor activities.	TAPAS Specific Facets
Commitment to Serve	High scoring individuals are more affectively committed to serving in the U.S. Military.	
Courage	High scoring individuals stand up to challenges and are not afraid to face dangerous situations.	
Physical Conditioning	High scoring individuals tend to engage in activities to maintain their physical fitness and are more likely to participate in vigorous sports or exercise.	
Situational Awareness	High scoring individuals pay attention to their surroundings and rarely get lost or surprised.	
Team Orientation	High scoring individuals prefer working in teams and help people work together better.	

Although the facets measured by the TAPAS appear useful for predicting attitudes, fit, and performance in military jobs, using a broader range of scales may provide a clearer and more complete profile of individuals. Therefore, the goal of the present task was to identify additional traits not measured by the TAPAS that could be developed to improve the prediction of performance and counterproductive behavior in positions of significant trust and authority. Below, we describe the process for developing and evaluating these scales.

Method

Identifying New Personality Traits for Development

  The first step in this work was to conduct a literature search to identify personality characteristics that may be relevant for Army personnel. This process involved several discussions with the U.S. Army Research Institute (ARI) authors to identify the most appropriate scales for development. First, DCG searched the empirical literature to identify traits that had demonstrated validity for predicting performance and counterproductive behavior in past research. After this initial search, a list of relevant personality traits was created and sent by the ARI authors for consideration. This initial list included definitions of these traits and previous findings on their validity for predicting relevant criteria. Each of these traits was then evaluated based on their potential validity and ability to add to the existing content of the TAPAS. After initial discussions with ARI authors, an additional search was conducted to gather further information on promising scales. Following this review, a second discussion identified the final list of scales to be developed.

Literature Search

  The results of the initial literature search are reported in Appendix A. Our initial search identified 10 potential scales that could be developed to supplement the TAPAS dimensions. Several of the dimensions identified in our review (e.g., Narcissism, Machiavellianism) were related to the dark side of personality (Paulhus & Williams, 2002). In addition, many of the personality traits identified had substantial validity for predicting performance or counterproductive behavior. For example, past research has found that Persistence has a strong positive relationship with performance ratings (.39; Tsai, Chen, & Liu, 2007) and Humility has a negative relationship with delinquent behavior (ranging from -.34 to -.55; Lee, Ashton, & de Vries, 2005). An additional literature search was conducted to review the literature on the validity of Time Orientation for predicting relevant outcomes.

  Based on the literature review, six dimensions were selected for the new TAPAS scales. These dimensions included Machiavellianism, Army Self-Efficacy, Self-Efficacy, Persistence, Humility, and Virtue. Table 2 describes these six dimensions. These dimensions were selected because they had limited overlap with existing TAPAS scales and had demonstrated strong validity in past research. The one exception was the Virtue dimension. As shown in Table 1, a Virtue scale was already available in the TAPAS. However, this scale had not performed as well in past research and did not have as many statements as other dimensions. Therefore, the goal of the present work was to focus on expanding the Virtue dimension to assess the broader construct of Integrity. We believe that this change will improve the validity of the Virtue scale for predicting performance.

Table 2. *Description of the Six New TAPAS Facets*

New TAPAS Facet	Brief Description
Humility	High scoring individuals think of other people before themselves and are not preoccupied with being recognized for their accomplishments.
Machiavellianism	High scoring individuals tend to manipulate or exploit others to get what they want.
Military Self-Efficacy	High scoring individuals are confident in their ability to be successful in any situation and to accomplish any task that they encounter in the military.
Persistence	High scoring individuals focus on accomplishing tasks until they are completed even when faced with difficult obstacles.
Self-Efficacy	High scoring individuals are confident in their ability to be successful in any situation and accomplish any task that they encounter in their daily lives.
Virtue	High scoring individuals adhere to standards of integrity, honesty, morality, and "good Samaritan" behavior.

Some of the scales identified in our literature review were not selected for development because they overlapped too much with existing TAPAS scales. For example, although Need for Power had shown strong validities in past research, this dimension is conceptually similar to the TAPAS Dominance scale. Therefore, this dimension was excluded from the development process. Other scales were excluded due to concerns about their content. For example, we decided not to develop a Narcissism scale because of its strong relationship with psychopathy (.50; Paulhus & Williams, 2002), which cannot be considered for selection decisions under the Americans with Disabilities Act (ADA). Instead, we chose to develop a Humility scale because it focuses on positive individual characteristics that are strongly related to performance criteria (e.g., Lee et al., 2005).

Developing Statement Pools

Next, large pools of statements were developed for each dimension. Because TAPAS can be administered in an adaptive format, it is desirable to have a sufficient number of statements reflecting high, intermediate, and low levels of the latent trait being evaluated. To develop these statements, we followed the process recommended by Drasgow et al. (2012) and by Cao, Drasgow, and Cho (2014). Specifically, content domains and available statements relevant to each new trait were first identified to guide statement writing. Next, subject matter experts with Ph.D.'s in Industrial and Organizational Psychology wrote 70-80 initial statements assessing behaviors, cognition, and affect for each new trait. These statements were written to span the respective trait continua, varying in extremity from low to high. Resulting statements were then reviewed for grammar, sensitivity, readability, and content redundancy. Overly long or repetitive statements were either edited or discarded. Ultimately, 50-60 statements per new trait were retained for pre-testing.

Estimating Item Response Theory (IRT) and Social Desirability Parameters

     To estimate the IRT and social desirability parameters needed for construction of the TAPAS pairwise preference items, the newly created statements were administered to large samples of Soldiers in the Active Army, Army National Guard, and Army Reserve components. Pretesting began in September of 2015 and ended in May of 2016. Over 2,200 Soldiers participated in the pretesting. Approximately 73% of the sample were men and 50.4% were Caucasian. In addition, 28.5% of the sample had attended college and earned a Bachelor's degree or higher. The sample was also comprised of Soldiers from various paygrades ranging from E-1 to E-9, with nearly 80% of the sample in grade E-5 or below.

     For the pretest sessions, multiple survey forms were developed to efficiently collect the data required for estimating the IRT and social desirability parameters for each statement. Across all forms, a common subset of statements was included so that parameter estimates could be placed on a common metric. Each form of the survey contained two main sections of TAPAS statements. The first section asked examinees to respond honestly. The second section asked examinees to fake good. In other words, Soldiers were asked to respond in a way that would make them look like good Army material. In both sections, data were collected using a four-point response format, where 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, and 4 = Strongly Agree. The honest section contained up to 160 pretest statements, while the faking section contained up to 80 pretest statements. In addition, each section contained up to 4 statements designed to flag unmotivated examinees by asking respondents to select a particular option (e.g., Strongly Agree) on the form. In between the two sections of TAPAS statements, the Army Life Questionnaire (ALQ) was also administered. The Army Life Questionnaire assess self-reported experiences in the Army such as Affective Commitment, Reenlistment Intentions, or Military Occupation Specialty Fit. However, the results presented below focus on the IRT analyses performed on the statement pools for the new traits.

     After the pretest data collections had concluded, data from the samples of Soldiers were then processed and cleaned to remove unmotivated examinees who provided invalid responses to at least one of the response check statements. The final sample consisted of 1,960 useable cases. Using this reduced sample, we then conducted IRT analyses. Because the goal was to incorporate these new scales into the TAPAS framework, we fit the data with the Generalized Graded Unfolding Model (GGUM; Roberts, Donoghue, & Laughlin, 2000). This same model is used for the TAPAS items and past research has indicated that this model is appropriate for personality items (Chernyshenko, Stark, Chan, Drasgow, & Williams, 2001; Drasgow, Chernyshenko, & Stark, 2010). Therefore, we expected this model to fit the data for the new dimensions as well.

     Data from the honest conditions were dichotomized and analyzed separately for each new trait using the GGUM2004 software (Roberts, Fang, Cui, & Wang, 2006). This software is widely used for estimating GGUM parameters in the empirical literature and has been used successfully on TAPAS data. Three GGUM parameters were estimated for each statement: discrimination (α), location (δ), and threshold (τ). After estimating the parameters, we then tested the fit of the GGUM to the data using the MODFIT computer program (Stark, 2004). GGUM parameters across different forms were linked via the mean-sigma linking method. The

polytomous data from the faking conditions were then used to estimate the social desirability of each statement by averaging responses over examinees.

Results

IRT and Social Desirability Parameters

In total, 310 statements from the six new TAPAS dimensions were pretested. Several statements had to be dropped during parameter estimation to facilitate GGUM2004 program convergence. In addition, statements having GGUM discrimination parameters below .40 were eliminated because they would have been very unlikely candidates for inclusion in the multidimensional pairwise preference (MDPP) format used in the TAPAS. Model-data fit was also examined to identify problematic statements.

Table 3 shows the breakdown of statements for each of the six new TAPAS dimensions. Specifically, for each facet, we show the number of pretested statements, the number of final statements after problematic statements were dropped, and example statements reflecting a high level of the trait. In total, this effort produced 278 usable statements, with at least 45 statements for each trait.

Table 3. *Numbers of Statements Representing Each of the Six New TAPAS Facets*

Trait Name	# of Statements Pretested	Final # of Statements	Example Statement
Humility	54	46	*I don't think that I'm better than other people.*
Machiavellianism	53	46	*I have been accused of "playing games" to get what I want.*
Military Self-Efficacy	48	45	*I think that military training will be easy for me.*
Persistence	50	45	*I hate leaving things incomplete or unfinished.*
Self-Efficacy	49	46	*I expect to master new skills faster than most others.*
Virtue	56	50	*I have a reputation for being honest and ethical.*

Next Steps

The goal of this work was to develop new scales that can be administered in the TAPAS framework and help to enhance the prediction of performance and counterproductive behavior. Our literature search identified a number of promising temperament scales with high potential for validity. However, six of these scales were selected as the most promising additions to the TAPAS. Therefore, large item pools were developed for each of these new dimensions.

The results of the IRT analyses indicated that the GGUM model fit the data well. This was not surprising given that this same model has been used for the other TAPAS scales. Therefore, the next step is to use the IRT item parameters and the social desirability ratings provided by the Soldiers in the pretest data collections to generate TAPAS forms that consist of a combination of traditional TAPAS scales and the new dimensions developed here. These new forms will then be administered to samples of Recruiters and Drill Sergeants to obtain validity estimates for the TAPAS dimensions in these positions of significant trust and authority. One of these validation studies will include a static form (Drill Sergeants) while the other uses a computer adaptive test (Recruiters). As such, these new dimensions will be evaluated using both administration formats.

In both of these validation samples, the goal of the research will be to collect some initial validation data for the new scales and additional data on several original TAPAS scales. Although we expect the TAPAS scales to be related to performance criteria, past research has indicated that composites of TAPAS dimensions are most useful for predicting performance and can vary across occupations (Nye et al., 2012). Therefore, we also anticipate that composites of these dimensions will show higher validity than individual scales. In addition, given the differences between the Recruiter and Drill Sergeant assignments, we also expect these composites to vary across these two samples.

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APPENDIX

LITERATURE REVIEW RESULTS

Table 1. *Literature Review*

Personality Characteristics	Example Items and Validity Data
Need for Power	**Need for Power subscale of the Personal Needs Scales** (Liu, Liu, & Wu, 2010) • I want other people to act in my way • I love to lead and be in charge • I love to compete and win **Correlations with Relevant Criteria**: • Performance in a managerial sample (.48; Stahl, 1983). • Creativity (r = .43; Hon, 2012) • Need for achievement (r = .38; Liu, Liu, & Wu, 2010).
Narcissism	**Narcissism Personality Inventory** (Raskin & Hall, 1979) • If I ruled the world it would be a much better place • I am going to be a great person • I know that I am good because everyone keeps telling me so • I really like to be the center of attention **Correlations with Relevant Criteria**: • Correlations with counterproductive behavior range from 0.23 to 0.43 (Grijalva & Newman, 2014; O'Boyle, Forsyth, Banks, & McDaniel, 2012). • Moderate levels of narcissism are ideal for leadership effectiveness, as opposed to very high or low levels (i.e. upside down U-shaped curvilinear relationship; Grijalva, Harms, Newman, Gaddis, & Fraley, 2014). • Base correlation with leader effectiveness is 0.15 (Galvin, Waldman, & Balthazard, 2010).
Humility	**HEXACO personality inventory, Modesty Facet** (Lee & Ashton, 2004) • I don't think that I'm better than other people • I see myself as an average person • (Reversed) I would like to have more power than other people **Correlations with Relevant Criteria**: • Correlations with workplace delinquency range from ¬0.34 to ¬0.55 (Lee, Ashton, & de Vries, 2005) • Job performance (0.18; Johnson, Rowatt, & Petrini, 2011).

Personality Characteristics	Example Items and Validity Data
Machiavellianism	**Mach-IV** (Christie & Geis, 1970) • Never tell anyone the real reason you did something unless it is useful to do so • The best way to handle people is to tell them what they want to hear • It is wise to flatter important people • It is safest to assume that all people have a vicious streak and it will come out when they are given a chance **Correlations with Relevant Criteria**: • Job satisfaction (r = -.19) and counterproductive behavior (r = .38; Dahling, Whitaker, & Levy, 2009).
Persistence	**Temperament and Character Inventory—Persistence Scale** (Cloninger, Przybeck, Svrakic & Wetzel, 1994) • I am usually so determined that I continue to work long after other people have given up • I usually push myself harder than most people do because I want to do as well as I possibly can • I do more than what's expected of me **Correlations with Relevant Criteria**: • Performance ratings (0.39), and organizational citizenship behavior (0.36; Tsai, Chen, & Liu, 2007)
Virtue	**Values in Action Inventory—Integrity/Honesty/Authenticity facet** (Peterson & Seligman, 2004) • I am trusted to keep secrets • I keep my promises • I am true to my own values • I lie to get myself out of trouble (Reversed) **Correlations with Relevant Criteria**: • Job satisfaction (0.64), intent to stay (0.33), and organizational commitment (0.52; Simons, Friedman, Liu, & McLean Parks, 2007). • Job performance (0.25; Finch, Edwards, & Wallace, 2009) • Organizational citizenship behavior (0.17; Dineen, Lewicki, & Tomlinson, 2006)

Personality Characteristics	Example Items and Validity Data
Hostility to Authority	**Computerized Adaptive Assessment- Personality Disorder, Norm Violation and Submissiveness subscales** (Simms et al., 2011) • Have always been a rule-breaker • Get in trouble with the law • Respect authority (Reversed) • Got in trouble a lot at school **Correlations with Relevant Criteria**: • Number of commendations received (.51), discharge from work (-.28), absenteeism (-.49), and job performance ratings (.26; Hogan & Hogan, 1989). • Supervisory ratings of mishandling cash (.23), absenteeism (.62), and termination for policy violation (.19; Sackett, Burris, & Callahan, 1989).
Adaptability	**Six-Factor Personality Questionnaire—Adaptability Subscale** (Jackson, Ashton, Tomes, 1996) • Am good at taking advice • Adapt easily to new situations • Can stand criticism **Correlations with Relevant Criteria**: • Job performance (0.21; Ahearne, Mathieu, & Rapp, 2005) • Handling work stress (.29-.70), handling emergencies (.40-.65), and dealing with uncertain situations (.40-.58; Pulakos, Arad, Donovan, & Plamondon, 2000).
Time Orientation	**GLOBE Survey, Future Orientation items** (Venaik, Zhu, & Brewer, 2013) • The way to be successful in this society is to: Plan ahead – take life events as they occur • In this society, social gatherings are: Planned well in advance (two or more weeks in advance) – spontaneous (planned less than an hour in advance) • I believe that people should: Live for the present – live for the future **Correlations with Relevant Criteria**: • Correlations with learning ranged from .25 to .34 (Bowles, 2008).

Personality Characteristics	Example Items and Validity Data
Self-Efficacy	**Generalized Self-Efficacy Scale** (Judge, Locke, Durham, & Kluger, 1998) • I am strong enough to overcome life's struggles • I often feel that there is nothing that I can do well (Reverse) • When I make plans, I am certain I can make them work • If something is too complicated, I will not even bother to try it (Reverse) **Correlations with Relevant Criteria**: • Job performance (0.38; Stajkovic & Luthans, 1998) • Transfer of training (0.39; Ford, Smith, Weissbein, Gully, & Salas, 1998) • Absenteeism (.23-.38; Harrison & Shaffer, 1994)
Competence	**The Abridged Big Five-Dimensional Circumplex, Competence Subscale** (Hofstee, de Raad, & Goldberg, 1992) • Learn quickly • Use my brain • Excel in what I do • Look at the facts **Correlations with Relevant Criteria**: • Training performance (0.38; Lent, Brown, & Hackett, 1994; Multon, Brown, & Lent, 1991). • Organizational citizenship behavior (.07-.10; Alge, Ballinger, Tangirala, & Oakley, 2006). • Job performance (0.19; Liden, Wayne, & Sparrowe, 2000).

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